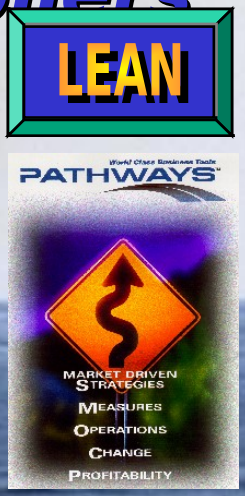
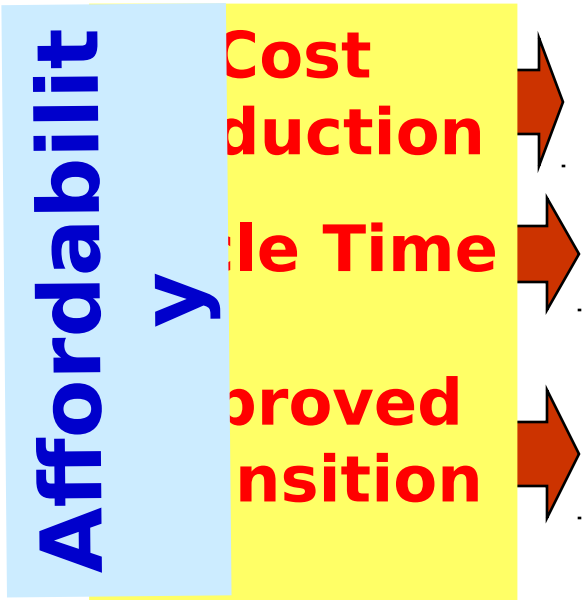
Lean-*Pathways:*
Improving the Lean Enterprise Capability of Small/Medium Size Weapons Systems Suppliers



Panel Chair: Leo Plonsky ONR Navy MANTECH
Panel Co-chair: Joe Hering, PTI ANDRULIS
Panelists:
Susan Moehring, TechSolve, Inc.
Paul Cejas, The Boeing Company
Dave Oliveria, Raymond Eng Ops, Kaman
Peter Weymouth, Maine Mfgr Ext.

MANTECH Scope



Processes that Reduce Acquisition & Support Costs for Defense Essential Needs

New Manufacturing & Design Processes that Provide for Rapid System Acquisition

- **Ramp Up & Mature Proven S&T Product Demonstrations**
- **Enterprise: Insertion of Lean Commercial Practices into Military Products**

Address Manufacturing Life Cycle Issues:

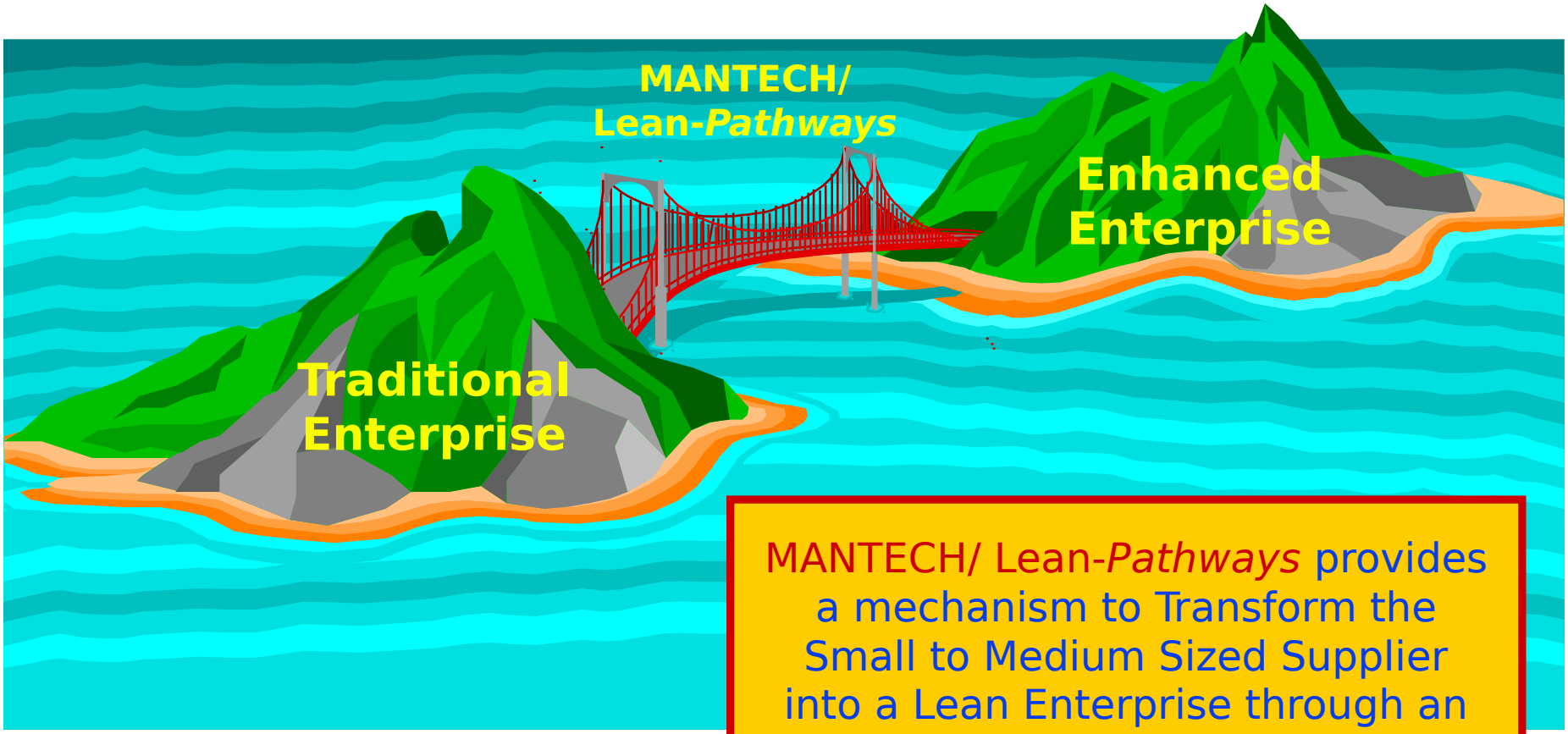
- ***Design & Development:*** **New, Repeatable Processes**
- ***Production:*** **Factory Operations, Supplier Capability**
- ***Support & Sustainment:*** **Maintenance, Repair, & Over**

Lean-*Pathways* Program Rationale

ONR/MANTECH's Emphasis: Address Warfighter Programs' Needs

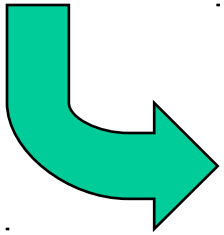
- **Product Costs:**
  - **Greater than 65% of Shipbuilding and Weapons Systems Costs Roll Up from the Suppliers to the Primes**
- **Lean-*Pathways* Provides Enterprise Approach to:**
  - **Improve Affordability**
  - **Improve Quality**
  - **Increase Inventory Turns**
  - **Eliminate Waste; Reduce Leadt**

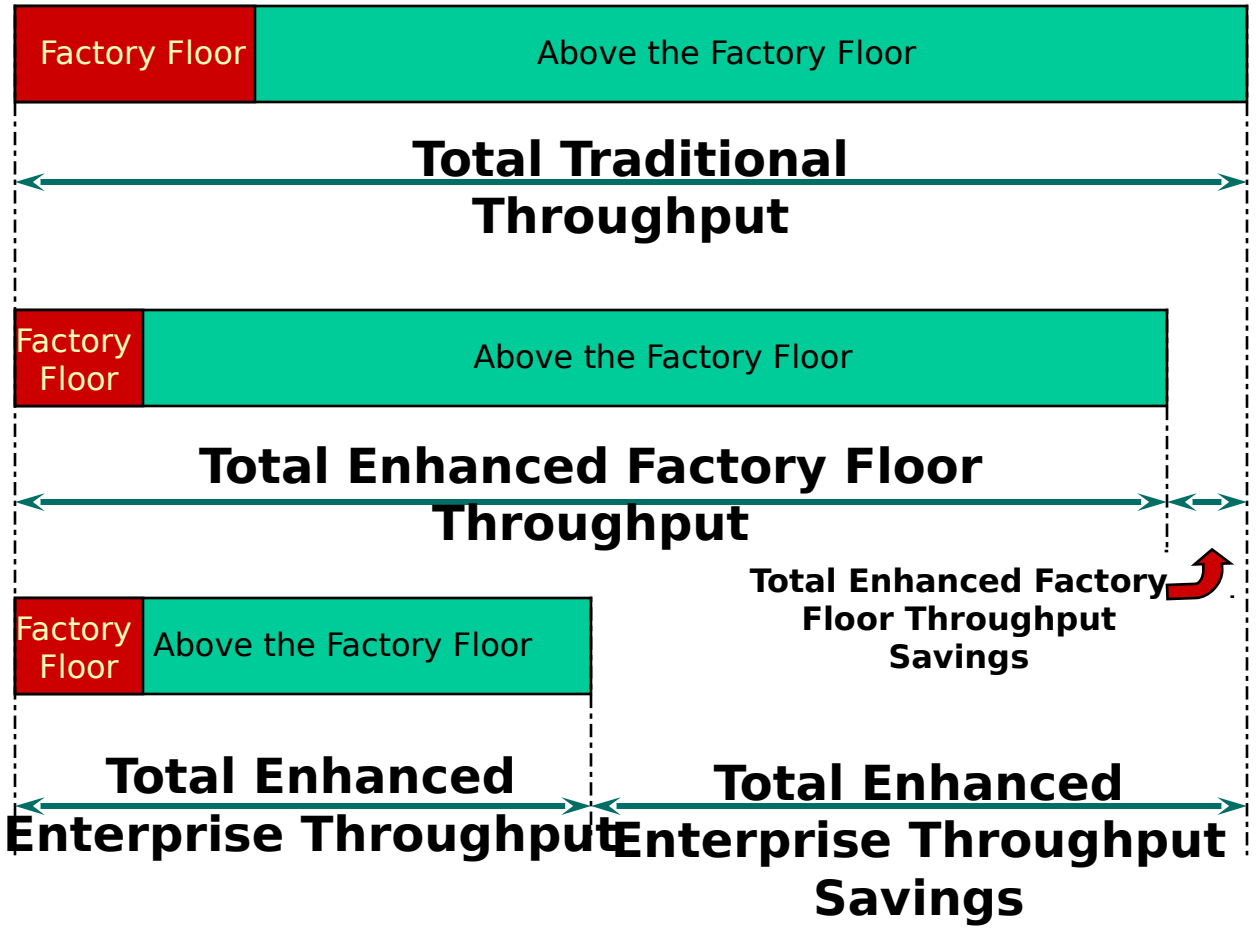
Pathways with Increased Emphasis on Lean Linkage



MANTECH/ Lean-*Pathways* provides a mechanism to Transform the Small to Medium Sized Supplier into a Lean Enterprise through an Integrated Application of the Lean-*Pathways* Methodology.

Where's the Value?
Enhanced Throughput Reduction





Agenda

- ONR *Pathways* Vision — Leo Plonsky
  - Background/ Origins
- *Pathways* Process — Susan Moehring
  - Integration of Lean Tools
- Boeing Lean-Pathways Supplier Pilot — Paul Cejas
- REO *Lean*-Pathways Journey — Dave Oliveria
- Shipbuilding Supplier Pilot — Peter Weymouth
- D.G. O'Brien Lean-*Pathways* Journey — Dave Dunfee
- Lean-*Pathways* Future — Joe Hering, Rick Davidson, Ralph Day

The *Pathways* Process – Integration with Lean Tools

Susan Moehring
TechSolve, Inc.

The *Pathways* Process

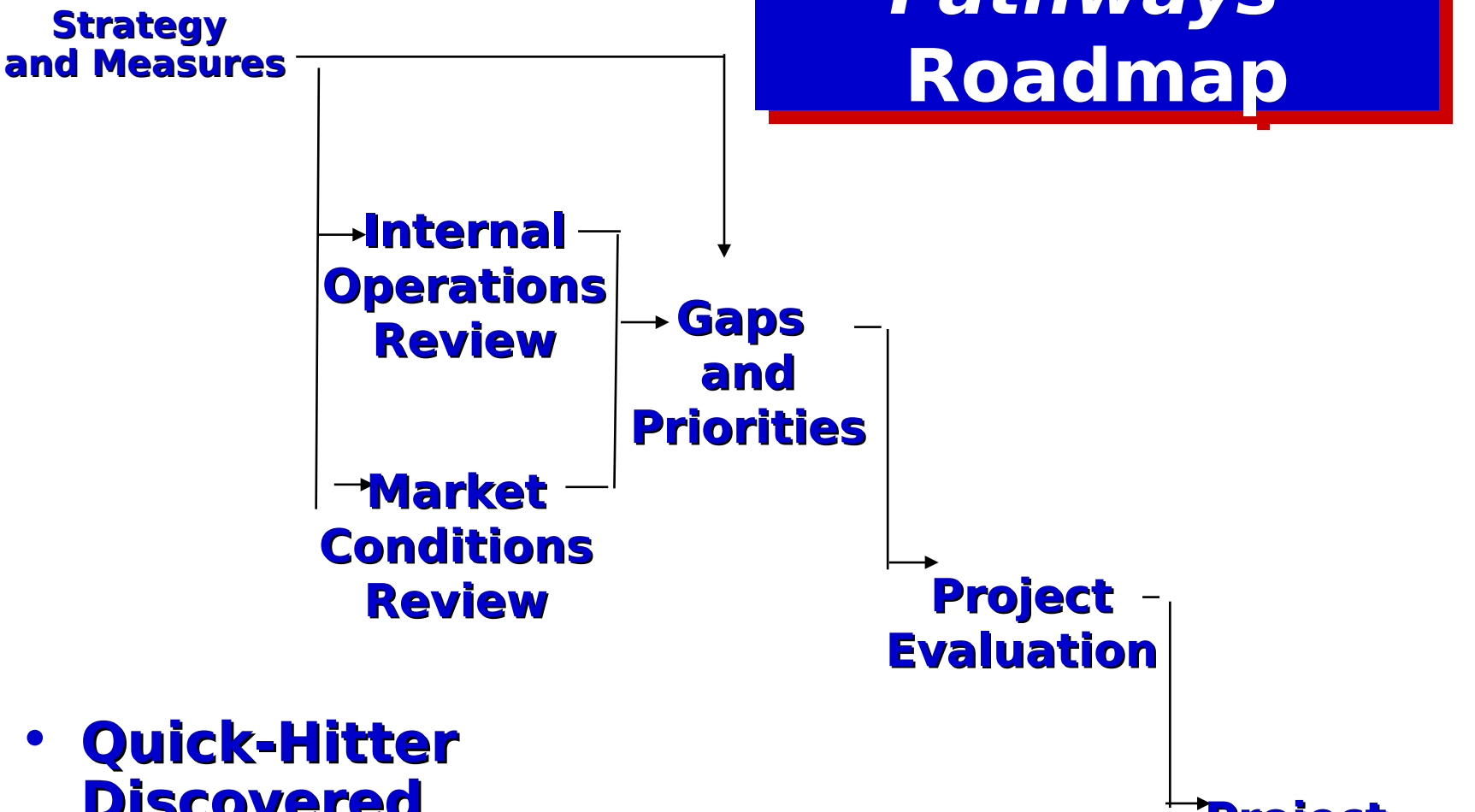
World Class Business Tools
PATHWAYS™

- Development Sponsored by ONR
- Addresses Enterprise-wide Improvement for Small to Medium Sized Manufacturing Companies
- Facilitated “How To” through Focused Workshop Sessions
- Incorporates Twenty-five (25) Proven Tools and Techniques
- Exercise-Based, Uses Company’s Own Data and Information
- Tools and Processes Become Company’s Own
- Establishes Framework for On-Going Company Self-Improvement

Why *Pathways* Was Developed?

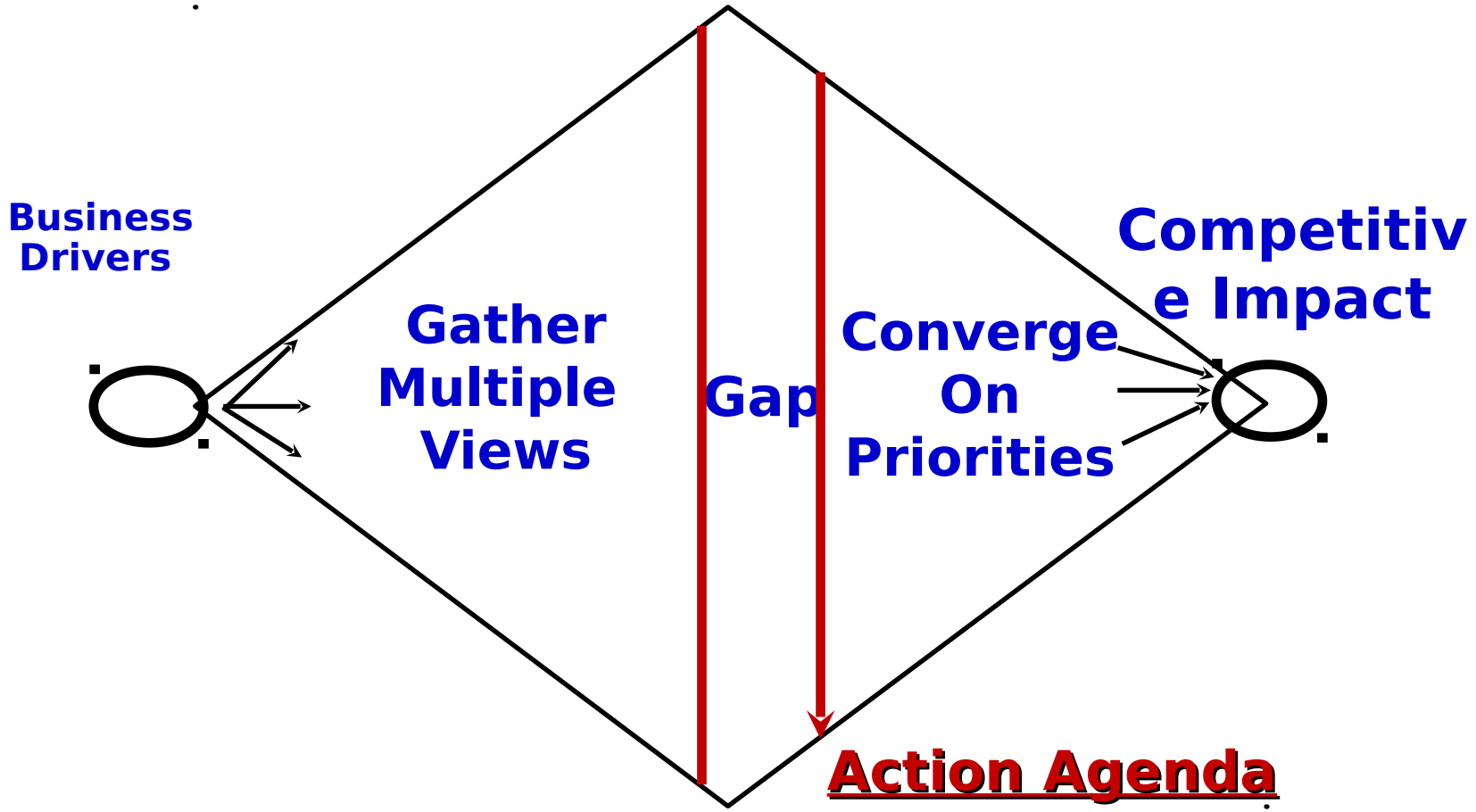
- **Small and Mid-size Businesses produce 50-80% of the value-added in manufactured products**
- **Competitiveness is critical to these companies as supply bases shrink**
- **Operational Improvements are key to enhancing competitiveness and increasing profitability**
- **Leadership Involvement is essential for change and sustaining continuous improvement culture**
- **Companies want:**
  - **Framework for change**
  - **Repeatable process**
  - **Approach that gets results**

Pathways Roadmap



- **Quick-Hitter Discovered Improvements can be Implemented Immediately**
- **Tools and Processes**

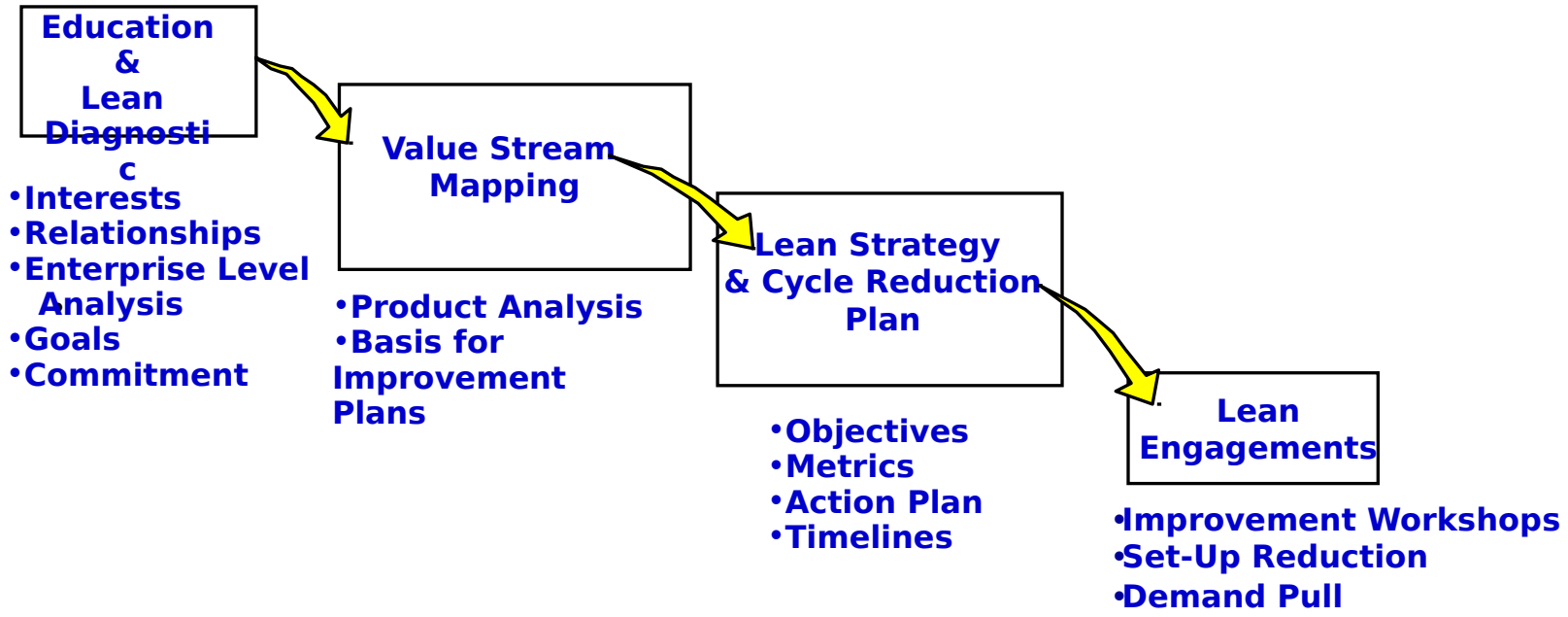
Pathways Divergent/Convergent Process

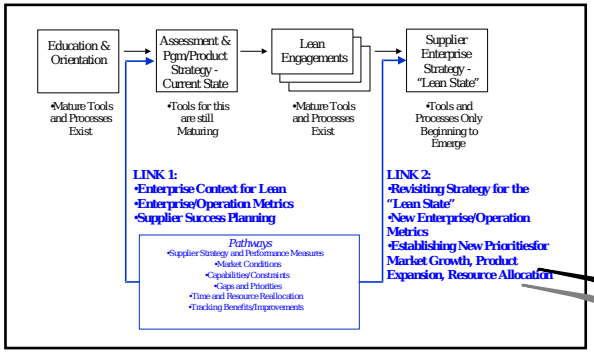


25 Tools To Investigate, Prioritize, Plan, Implement and Measure Competitive Opportunities

Integration of Lean Tools with *Pathways*

Integrating with selected Lean Tools promotes a "value stream" focus and "jump-starts" the introduction of change




Education & Orientation
Assessment & Pgm/Product Strategy - Current State
Lean Engagements
Supplier Enterprise Strategy - "Lean State"
•Mature Tools and Processes Exist
•Tools for this are still Maturing
•Mature Tools and Processes Exist
•Tools and Processes Only Beginning to Emerge
LINK 1:
•Enterprise Context for Lean
•Enterprise/Operation Metrics
•Supplier Success Planning
LINK 2:
•Revisiting Strategy for the "Lean State"
•New Enterprise/Operation Metrics
•Establishing New Priorities for Market Growth, Product Expansion, Resource Allocation
Pathways
•Supplier Strategy and Performance Measures
•Market Conditions
•Capabilities/Constraints
•Gaps and Priorities
•Time and Resource Reallocation
•Tracking Benefits/Improvements

BOEING
Military Aircraft & Missile Systems
SUPPLIER MANAGEMENT & PROCUREMENT

DEPARTMENT OF THE NAVY
USN ONR Science & Technology

The Pilot Tested an Integrated Boeing Supplier Lean/*Pathways* Transformation Process

Boeing Supplier Lean Enterprise

B_0 Project Initiation & Kick-Off Meeting

B_1 Supplier Lean Enterprise Assessment & *Pathways* Primary Driver

Supplier ID Team

B_2 Product Value Stream Mapping

B_3 Product Line Planning for Lean Transformation

B_4 Supplier Lean Engagements

Review & Document Supplier Lean Strategy (Two 1-Day Sessions Over 2 Weeks)

P_1 Supplier Strategy & Performance Measures

P_2 Capabilities & Constraints

P_3 Market Conditions

P_4 Gaps & Priorities

P_5 Time & Resource Reallocation

P_6 Implementing Change & Measuring Impact

Pathways For Continuous Improvement

BOEING®
Military Aircraft & Missile Systems
SUPPLIER MANAGEMENT &
PROCUREMENT

NAVY MANTECH
manufacturing technology program

DEPARTMENT OF THE NAVY
USN ONR
Science & Technology

Boeing Lean-*Pathways* Pilot Overview

Paul Cejas
The Boeing Company

LEAN

A Lean Message

My challenge for management is straightforward: Get on board with Lean. Support your people who are pursuing it, and leverage their ideas. Don't be a roadblock and burden your teams with excessive requirements to prove Lean concepts through business cases before implementing them. *There's more than enough evidence to support the fact that Lean works, and an occasional "leap of faith" is OK.* And don't expect to find cookie-cutter approaches for injecting Lean into your operations. Nothing is easy, and lean is hard work. But the payoff – for everyone involved – is proving to be well worth it.

Lean-*Pathways* Transformation Process Objective:

To Transform the SME into a Lean Enterprise through the Application of Integrated Lean-*Pathways* Methodologies:

- **Use *Pathways* to Identify the Enterprise Context for Lean, Strategically Focus Found Capacity and Establish the Leadership Infrastructure for Sustaining the Lean Journey**
  - **Business Case for Lean**
  - **Strategy for Lean State - New Markets and New Products**
  - **More Durable Relationships with OEMs and the Government**
- **Transform the SME**
  - **Production Operations: Leaner, More Responsive, More Flexible**
  - **Business Operations: Electronic Commerce, Gain-Sharing Opportunities**
  - **Strategic and Operating Plans: Stronger Presence in the Value Stream**
- **Use Lean to Find Hidden Capacity**
  - **People**
  - **Physical Plant & Equipment**
  - **Capital**

More Capable Suppliers
More Affordable Products

Supplier Lean Enterprise Transformation Model

Program Value Stream

Supplier Selection

- Critical Path
- Cost
- Quality
- Cycle Time
- Delivery

Lean Ready?

Yes

No

Work Outstanding Issues

Education and Orientation

- Compelling Interests
- Building the Relationship
- Understanding Context
- Commitment to Go Forward

Lean Assessment and Value Stream Mapping

- Enterprise-Level Analysis
- Product-Level Analysis
- Basis for Improvement Plans

Lean Strategy and Deployment Plan

- Common Objectives
- Common Metrics
- Plans of Action
- Timelines

Lean Engagements

- Improvement Workshops
- Additional Training

Continuous Improvement

Supplier Lean Enterprise-*Pathways* Transformation Pilot - Supplier Selection

Three Boeing Suppliers Were Selected From Major Navy Programs

Boeing
Supplier Lean Enterprise

U.S. Navy
Pathways for Continuous Improvement

Pathways Delivery Team
TechSolve and PTI Andrulis

Lean Transformation

Frontier Electronics
F/A-18 E/F Engine
Fuel Display

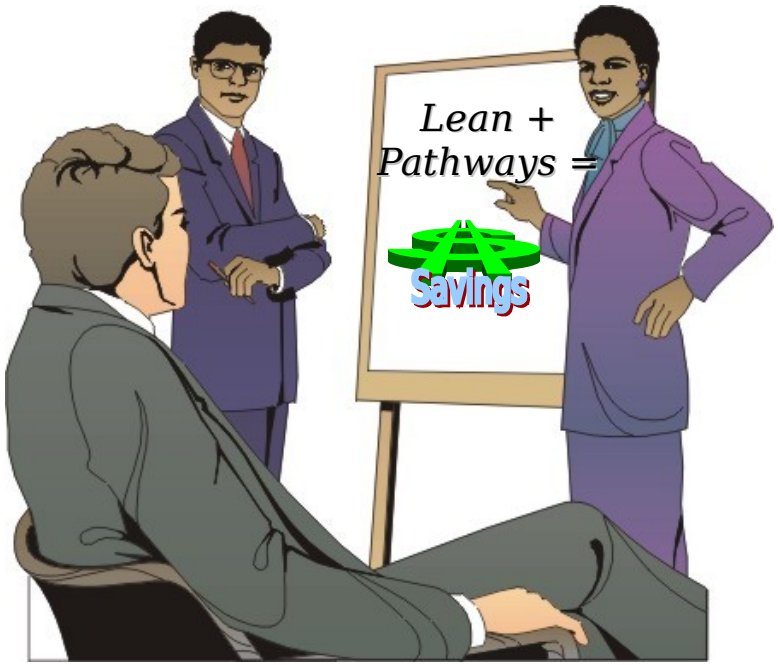
Raymond Engineering
Harpoon/SLAM-ER Fuses

Merritt Tool
V-22 & JSF Complex Machinin

Lean-*Pathways* Pilot Program - Roles

- **Suppliers**
  - **Three to Ten of the Supplier's Leadership Team Participated in the Six *Pathways* Sessions**
  - **Cross Section of Supplier's Workforce Participated in the Lean Engagements**
- **Boeing Led the Supplier Lean Enterprise Engagement Activities with the Selected Suppliers**
  - **Boeing SM&P Supplier Lean Promotion Office Provided Lean Specialist**
  - **Boeing Program Supplier Management Provided a Buyer or Supplier Manager**
- ***Pathways* Delivery Team Led the *Pathways* Sessions**

Lean-*Pathways* Pilot - Supplier Benefits



- **Suppliers Received Over 500 hours of Lean Enterprise Consulting from Boeing**
- **Suppliers Received Over 200 Hours of Strategy-to-Action Facilitation and Support from the USN-sponsored *Pathways* Delivery Team**
- **Suppliers Became Self-Sufficient in Lean and *Pathways* Tools to Support On-Going Improvement**

Lean-*Pathways* Pilot - Results

Integrated Process Was Successful:

- **Well Received by Suppliers**
  - **Excellent Supplier/OEM Interaction**
- **Good Boeing/TechSolve/Navy Teaming Arrangement**
- **Lead / Cycle Time Reductions and Cost Reductions Identified and Captured**

Nominated for Defense Manufacturing Technology 2000 Achievement Award

Frontier Electronic Systems

SELECTED RESULTS:

- **Enterprise Team Has Bought in to Lean-*Pathways* Culture**
- **Reduced Order to Cycle Time 40%**
- **Reduced EFD Product Cost 48%**
- **Increased Capacity without building by 30%**
- **Increased Sales by 18%**

Merritt Tool

SELECTED RESULTS

- **"Quick Hitters" Implemented:**
  - **Move & Combine Sawing and Identification Operations**
  - **Built Fixture for Coordinate Measuring Machine**
  - **Moved Final Bore Operation to More Efficient Mill**
  - **Cut Costs on Shipment Boxes**
- **Offered Customers 2-1/2% Price Reduction on $4 Million of Work**
- **Forecasts 4% Reduction in Labor, Providing 27% Negotiated Price Reduction Over Next**

Raymond Engineering Ops.

SELECTED RESULTS:

- **Cycle time and setup time reductions of 50%-70%**
- **Formulating new metrics that are leading vs. lagging indicators**
- **Determined most important areas to improve for cost avoidance**
- **SLAM-ER Fuze leadtime reduced by >18%**
- **Quoted price reduction on SLAM-ER fuze of 2-1/2% per year for next 2 years.**

Middletown, CT
205,0(

LEAN

PATHWAYS
World Class Business Tools

MARKET DRIVEN
STRATEGIES
MEASURES
OPERATIONS
CHANGE
PROFITABILITY

The Lean-*Pathways* Journey at REO

Dave Oliveria
Raymond Engineering Operations/ Kaman Aerospace Corporation

KAMAN

Colorado Springs, CO
15,000 ft²

REO Employees and Products

- **Employees ≈ 250 people**
- **Business: Engineering Design & Manufacturing**

Memory Products

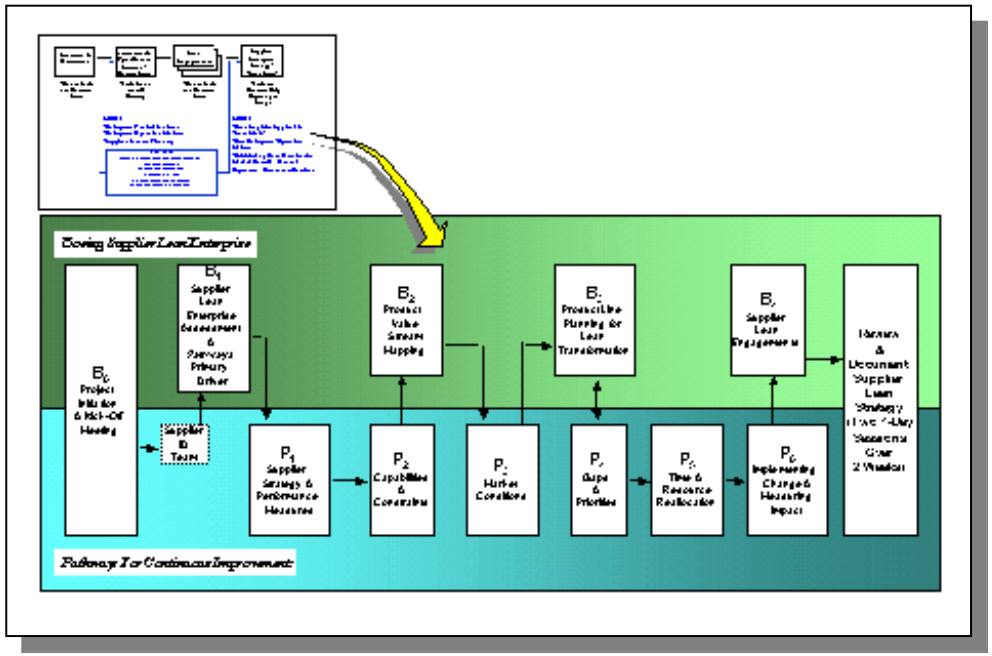
Microwave Products

Fuzing Products

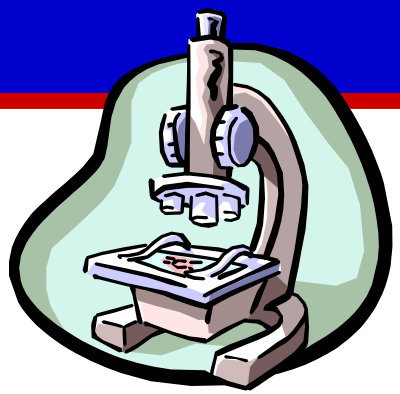
Measuring Systems

Lean-*Pathways* Transformation Model

Lean-*Pathways* Focuses on Tangible Improvements that can be Transitioned Throughout the Organization



Expectations



- **A Thorough Analysis of Our Operation**
  - **Exposing Opportunities for Improvement**
  - **Get the Entire Management Team in Sync with the Need for Change**
  - **Develop a Unified Approach to Change with Good Understanding of the Rationale**
- **Advance Our Lean Enterprise Activities**

Primary Driver

- **Current State – Customer Segment**
  - **Niche Market, Specialized Services, High Quality, Customer Focus, Premium Price**
- **Future State – Quality**
  - **Quality Processes in All Areas will Accomplish the Above with Higher Quality and Reduce Costs**

Order Winning Criteria

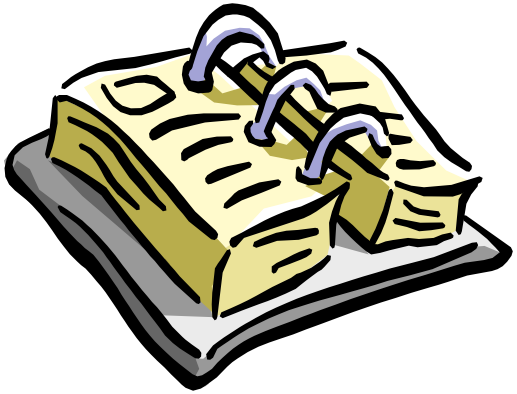
- Quality
- Price
- Speed
- Existing supplier
- Technical capability

Critical Areas Identified

- Production
- Quality
- Engineering
  - Manufacturing/Engineering relationships
- Material control
- Material acquisition

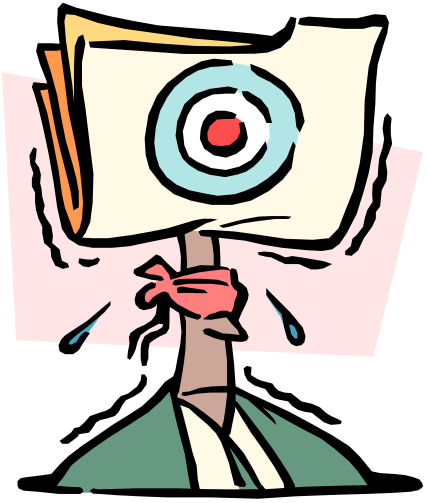
Root Causes

- **Production Processes**
  - **Schedules**
  - **Batch Processes**
  - **Supplier Base**
  - **Cell Focal Point/Leadership**
  - **Inventory Management Plan**



Root Causes - continued

- **General Work Standards**
  - **Mediocrity**
  - **Discipline**
  - **Responsibility**
  - **Communications**



Root Causes - continued

- **Management**
  - **Planning**
  - **Clear Definition of Goals**
  - **Flow Down of Strategies**

Plan of Action

- **Identified Projects and Lean Events**
  - **Grouped According to Relationships**
- **Established Department Operating Plans**
  - **Incorporated These Plans and Goals**
    - **Related Projects to Other Activities That Are in Process**

Prioritized Actions

- Management plans
- Responsibilities
- Communications
  - Flow down of Strategie
- Cell focal point/Leadership
- Supplier Base Improvement
- Engineering skills
- Metrics

Implementation

- **Department Operating Plans**
- **Cell Maturation Plan**
- **Reduced Lead Time Plans**
- ***Pathway's* and LEAN Workshops**

Cell Maturation Plan

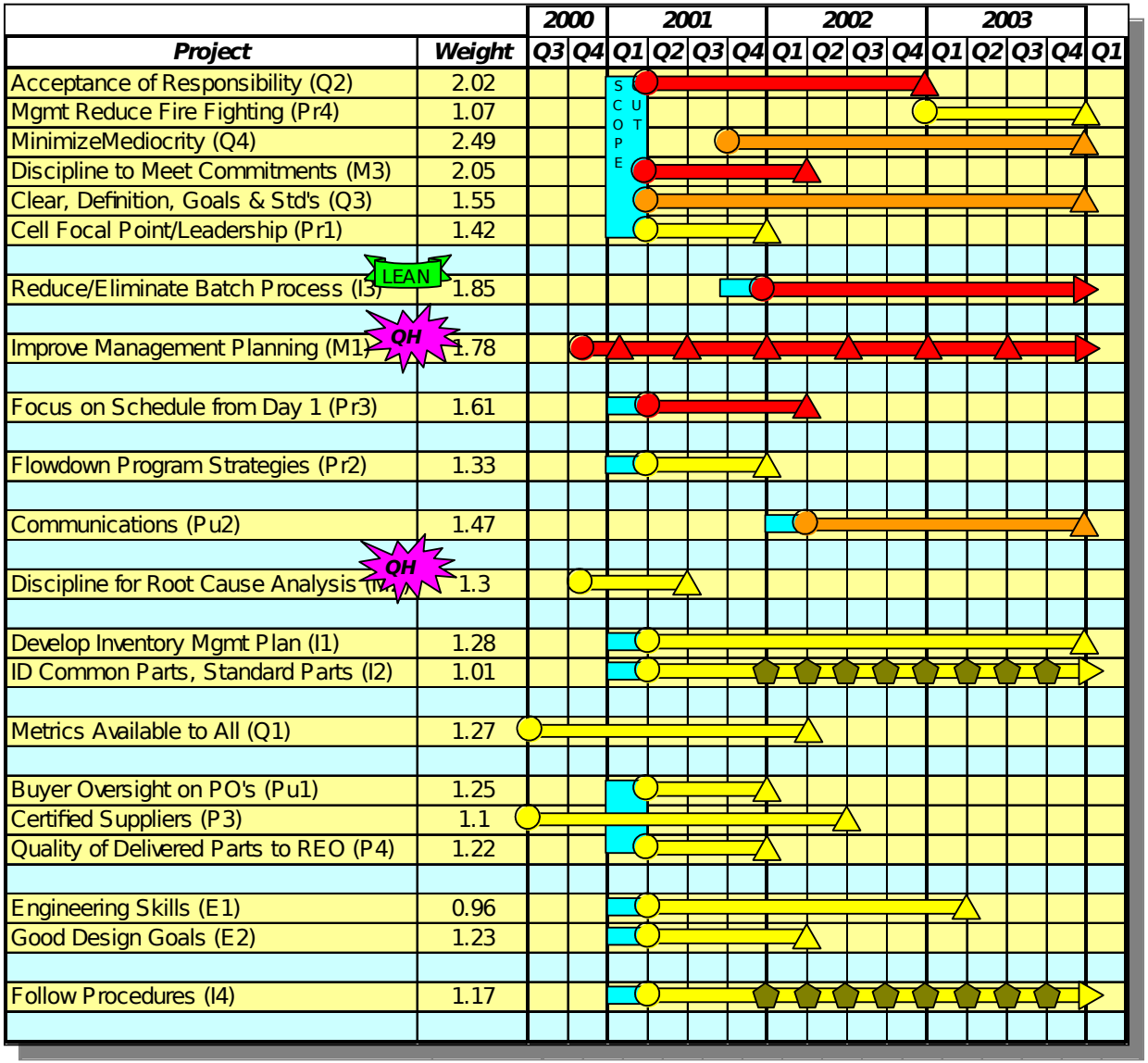
Lean Activity	Fuzing Cell #1	Air Tech Cell	Memory Elec Cell	Measuring	Microwave	Machine Shop Cell
Cell Organization	√	√	√	√	√	4Q01
Flow Organization	√	√	√	1Q01	√	4Q01
On-Line Stores	√	√	√	√	√	Raw Material
Current VSM	3Q01	SLAM-ER	4Q01	2Q02	2Q02	N/A
Future VSM	3Q01	SLAM-ER	4Q01	3Q02	3Q02	N/A
KAC Workshop	N/A	Wkshp #xx	1 by 3Q01	1 by 4Q01	1 by 4Q01	Wkshp #xx
AIW	AIW #2	AIW #1	3Q01	2Q02	3Q02	AIW #3
SRE	1Q01	1Q01	2Q01	2Q01	4Q01	SRE #1-7
5S	Part of AIW	Part of AIW	1Q00	Part of AIW	Part of AIW	5S #1
TPM	3Q01	3Q01	4Q01	4Q01	3Q01	Starting
Cell Buyer	Note (1)	Note (1)	Note (1)	In Training	√	N/A
Pgm Lead- Time Reduction Plan	AMRAAM	SLAM-ER	1553	1Q02	2Q02	N/A
Reduce Batch Requirements	Redefine AMRAAM LAT 4Q02	Redefine SLAM-ER LAT 2Q03	2Q02	3Q01	4Q01	Start 4Q00
Lean Training	All by 3Q01	All by 3Q01	All by 2Q01	All by 4Q01	All by 4Q01	All by 2Q01
Rec. Inspection	All by 2Q02	All by 2Q01	All by 1Q02	√	√	
Shipping	All by 2Q02	All by 2Q01	All by 1Q02	√	√	
Cell Manager	All by 4Q01	2Q01	3Q01	√	All by 2Q02	
KEY:	COMPLETE		To Be Done 01		To Be Done 02	

Note:

(1)Cell to be merged with Air Breather Cell (by 3Q01). Support group was merged in 2000 and is common to both. Merger will be complete with on-line stores and flow organization.

(2)Reviewing to determine how best to satisfy the cell buying requirements.

Project Plan

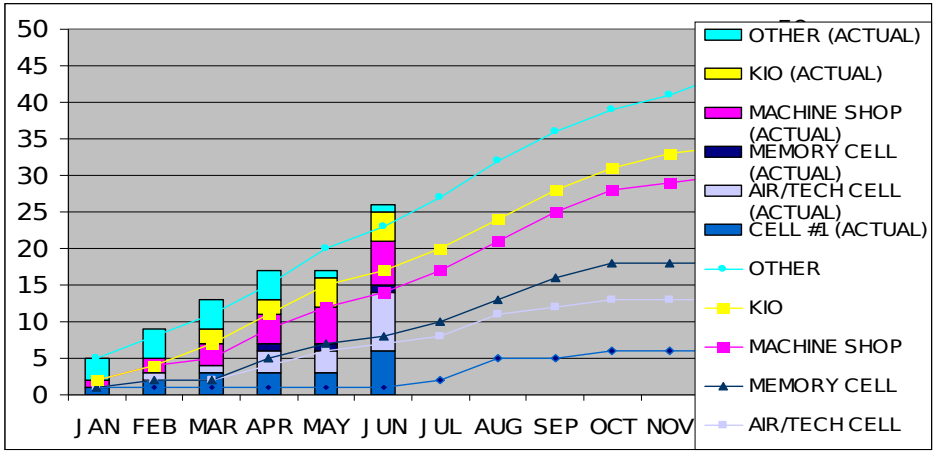

2000
2001
2002
2003
Project
Weight
Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1
Acceptance of Responsibility (Q2) 2.02
Mgmt Reduce Fire Fighting (Pr4) 1.07
MinimizeMediocrity (Q4) 2.49
Discipline to Meet Commitments (M3) 2.05
Clear, Definition, Goals & Std's (Q3) 1.55
Cell Focal Point/Leadership (Pr1) 1.42
LEAN
Reduce/Eliminate Batch Process (I3) 1.85
QH
Improve Management Planning (M1) 1.78
Focus on Schedule from Day 1 (Pr3) 1.61
Flowdown Program Strategies (Pr2) 1.33
Communications (Pu2) 1.47
QH
Discipline for Root Cause Analysis (I 1.3
Develop Inventory Mgmt Plan (I1) 1.28
ID Common Parts, Standard Parts (I2) 1.01
Metrics Available to All (Q1) 1.27
Buyer Oversight on PO's (Pu1) 1.25
Certified Suppliers (P3) 1.1
Quality of Delivered Parts to REO (P4) 1.22
Engineering Skills (E1) 0.96
Good Design Goals (E2) 1.23
Follow Procedures (I4) 1.17
SCOPE
OUT

Monitoring Progress

- **Key Metrics Involving All Activities**
  - **Improvement Goals Set for 2001**
  - **Tied to Process Improvements**

REO Lean Enterprise Status

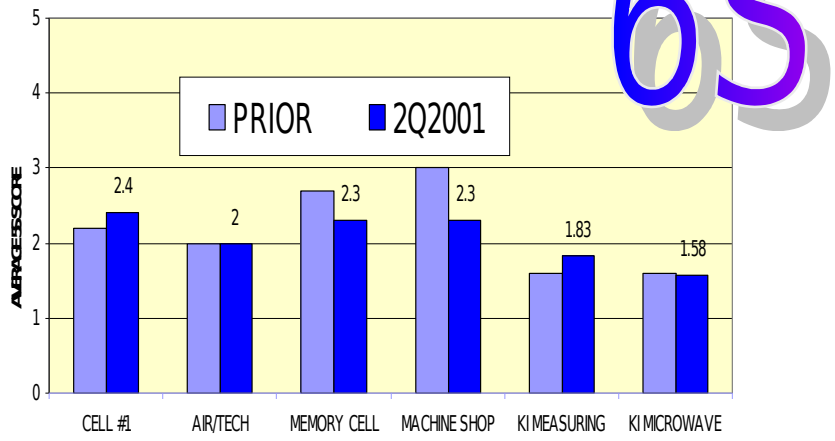
2001 Lean Events



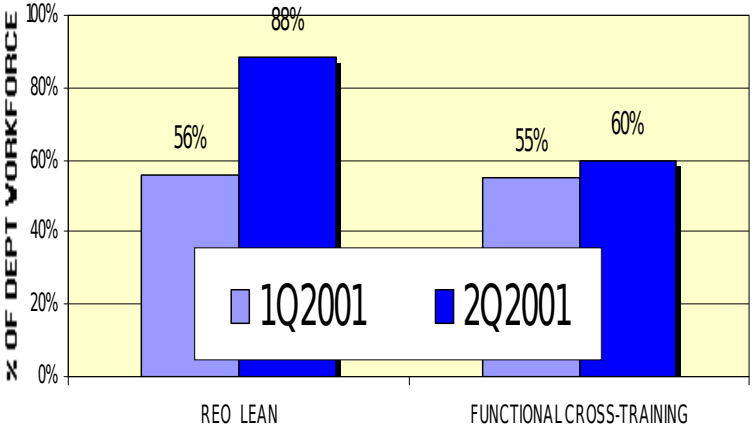
Comments

- *REO Lean Training Goal – 100% (reached 88%) by June 2001*
- *KIO Lean Training Goal – 100% by Dec 2001*

6S Maturity



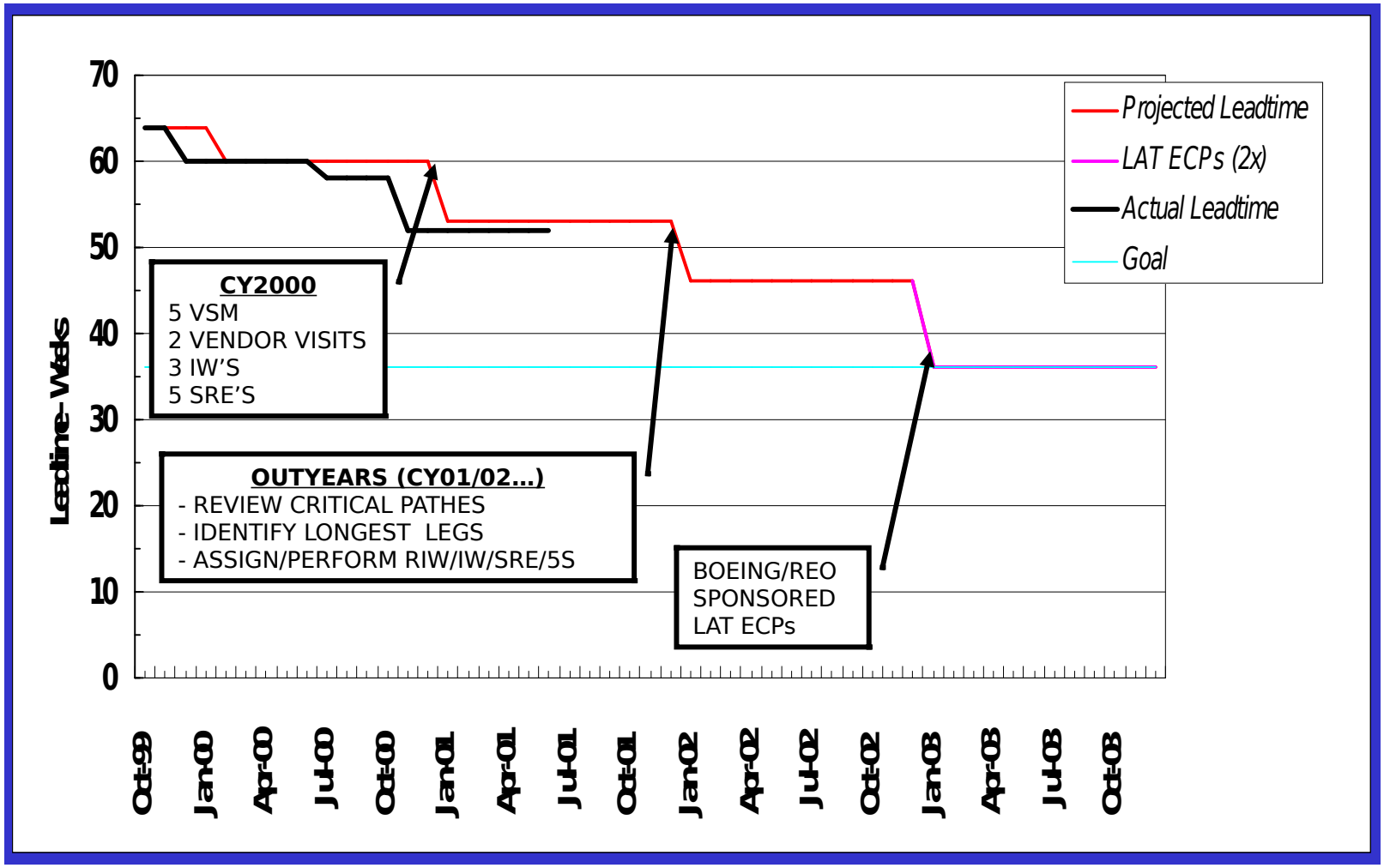
Training



Accomplishments to Date

- **Lead Time Reduction**
- **Improved Quality**
- **Improved Deliveries**
- **Many More Metrics**
- **Improved Teamwork**

SLAM-ER Lead Time Reduction



CY2001 Plan to Achieve 46 Week Goal

SLAM-ER Fuze - FMU-155/B

CY2001 IMPROVEMENT PLAN TO SUPPORT 46 WEEK LEAD TIME SUMMARY GOAL BY 12/31/01

Item	*Part Number*	*Part Name*	*WkD*	*TtD*	*Action*	*Actionee*	*New D*
1	R3123AS446	Lever, Rotor Lock, Casting	100		Switching to Machine Complete (casting part		
	3123AS517	Lever, Rotor Lock	72	172	will be obsolete)	DO/JA/BL	<130D?
2	3123AS499SF	Gear, Timing (R5481SF)	80	80	Last two orders 40d - change MRP to 50d	DO/CR	50d
3	3123AS453	Cap, Sol, Sprng Retn Mtg	80	80	Conduct AIW on Solenoid parts & assy		
	3123AS476	Housing, Solenoid	75	75	process (goal is to reduce total lead time by		
	3123AS478	Spool, Solenoid	55	55	at least 10 days/2 weeks; include shop/coil)	DO/Cell	<30D?
4	3123AS429	Housing, Electrical Connector	75		Map process, target long lead steps		
	3123AS311	Connector Assy	70	145	Map process, target long lead & vendor	DO/Cell?	Not Crit.
5	3123AS513	Bearing, Ball, Annular	105	105	Supplier Visit - Blanket PO/Forecast	DO/JK/BH?	<90D?
6	3123AS524	Insert, Piston Housing	40		Switching to Machine Complete for all four		
	3123AS3332	Insert, Piston Housing	20		part numbers. Need to find out newprocess		
	3123AS525	Housing, Cast	43		lead time and take action if necessary.		
	1765AS5167-1	Housing, Piston	45	148		DO/JA/BL	<128D?

OPPORTUNITIES

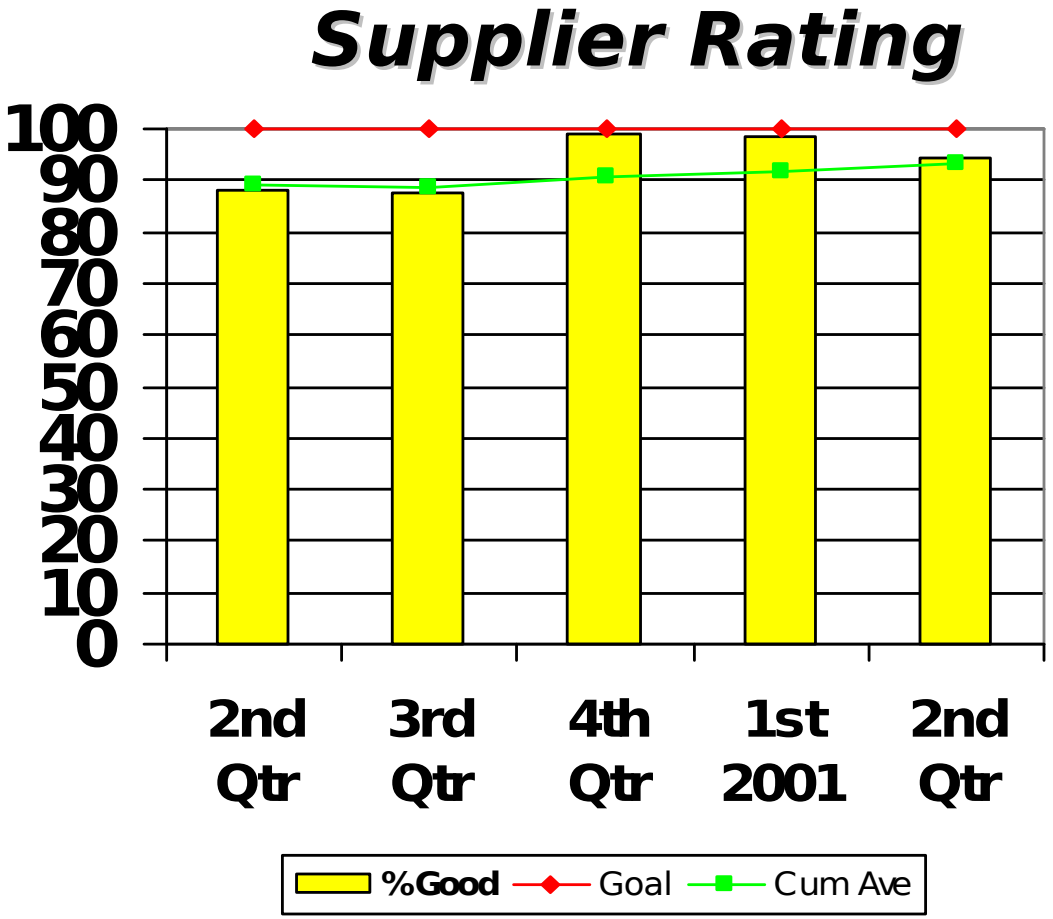
1 Switch solenoid wire to coated to reduce baking/curing time requirements

2

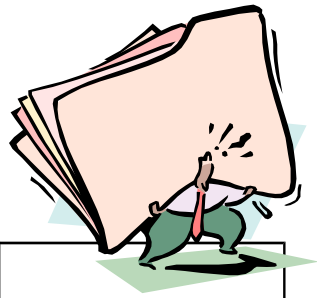
3

Supplier Quality/Delivery

- **Supplier Quality Base**
  - **Assessment by Cell**
    - **Intervention with suppliers below standard**
    - **The supplier base will be reduced**
  - **Lean workshops for reduced lead times**
    - **Reduced lead time with two suppliers by more than 50% just based on communications**



AIW #1-#3 Summary

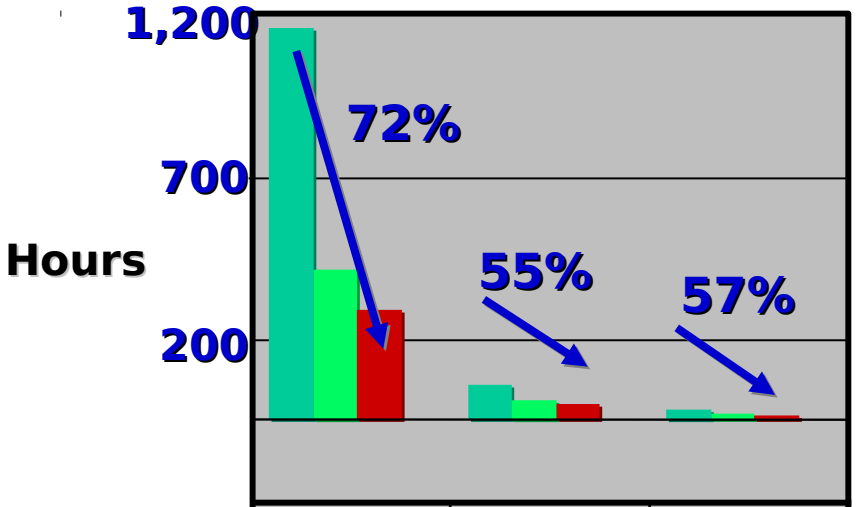


Process Improvements	Cycle Time	WIP	Queue Time	Travel
AIW #1 EMA Assy	61%	75%	75%	55%
AIW #2 Line Flow	52%		51%	40%
AIW #3 Mach Shop	Set-up 68%		50%	

AIW #4 – ECP Process

The AIW Team

- Implemented an Interim Process That Will Reduce the Process Time by 62% (151 Days to 57 Days)
- Reduced Customer's (and Their Customer's) ECP Processing Labor by 79% (67.5 Hrs to 14 Hrs)
- Established a Process to Provide Additional Time Reductions; Total ECP Approval (57 Days to 42 Days)
- Agreed to Incorporate Revised

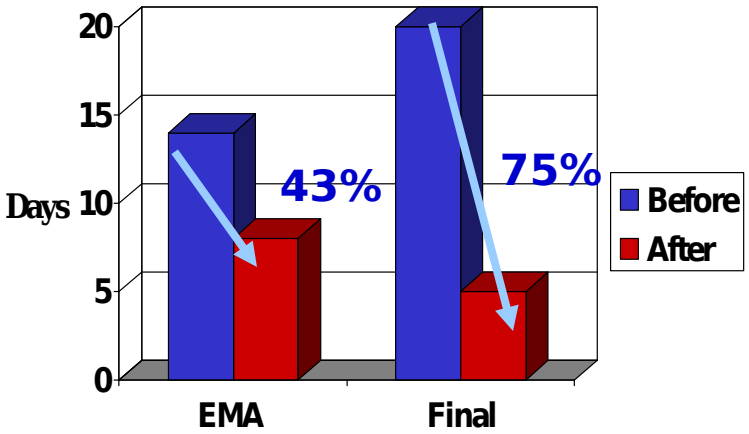


	Total	Direct	Handoffs
Current	1208	104.5	28
Interim	456	54.5	15
New	336	47.5	12

BOEING
Raytheon
KAMAN
NAWC
NAVAL AIR WARFARE CENTER

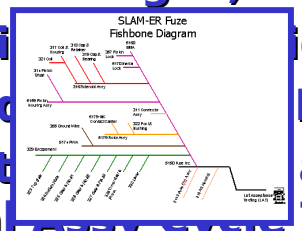
AIW #5 – Air Breather Cell

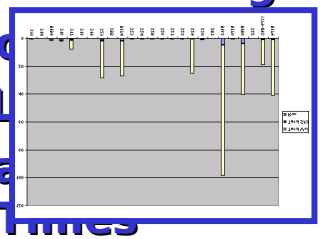
5-Pc Flow - Days to First Piece



Results

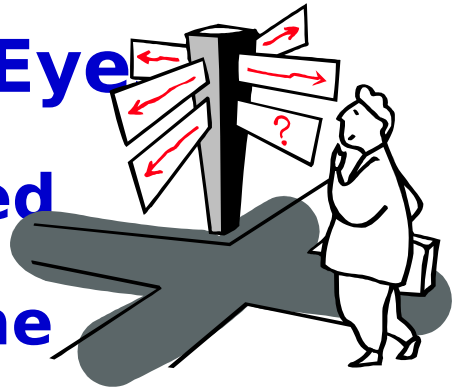
- Increased 5S Score from 2.2 to 2.7
- Simulation Flow Line with 5-piece Optimum Flow to First Piece Reduced (realized with continuous flow production):
  - EMA First Piece Cycle Time from 14 to 8 days
  - Final Assy from 20 to 5 days
  - Reduced degree of Risk of Failures/ Defects
- Developed Visual Manufacturing Instructions that all Cells are excited about and Want to Use. New Approach will reduce paper consumption and workbench clutter
- Added new signs, floor markings
- Centrali
- Groupe
- Generat and Final Assy cycle Times





Close

- ***Pathways* Has Opened Our Eyes**
  - **Our Perceptions Have Changed**
  - **Our Path to Success Lies in the Quality of Our Processes**



- **Every Lean Event Creates More Opportunity for Improvement**
- **The Tendency to Revert Back to the Old Ways Continues to Haunt Us**

Close - continued

- **Our Lean Journey Is Well Understood**

  - **We Are 1 Inch on a Never Ending Trail.**

Maine Manufacturing MEP Extension Partnership
Affiliated with NIST / MEP

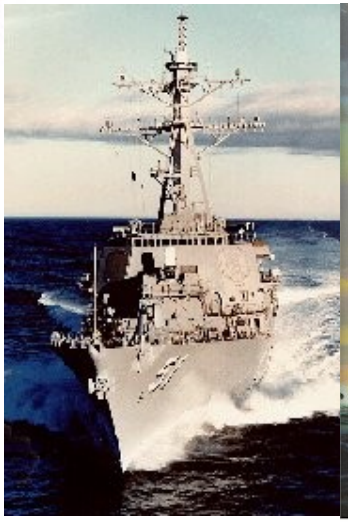
Bath Iron Works
A GENERAL DYNAMICS COMPANY

Department of the Navy · USN · ONR · Science & Technology

NAVY MANTECH
manufacturing technology program

Dual Use S&T

ONR/BIW/ MAINE MEP
Lean-*Pathways* Shipbuilding Supplier Pilot



Partnership

This Pilot Involves a Partnership between:

- **ONR**
- **The Maine MEP**
- **Bath Iron Works**
- **Five Navy Suppliers**

Lean-*Pathways* Shipbuilding Supplier Objectives

Dual Use S&T

- **To Eliminate Waste and Drive Quantum Improvements at Pilot Companies**
- **To Demonstrate the Merits of the Navy MANTECH/DUS&T-sponsored Pilot to Navy Shipbuilding PM's and the Shipbuilding Community**
- **To Encourage the Continued Use and Expansion of the Lean-*Pathways* Methodology to Positively Impact Shipbuilding and Weapon Systems Affordability**

Suppliers of Importance to BIW's Value Chain Were Selected

Howell Laboratories, Inc.
Bridgton, Maine

Howell Labs

ACL INDUSTRIES, INC.
MANCHESTER, NH

"ENGINEERING, FABRICATIONS AND WELDMENTS TO SPECIFICATION"

ACL Industries

D.G. O'Brien

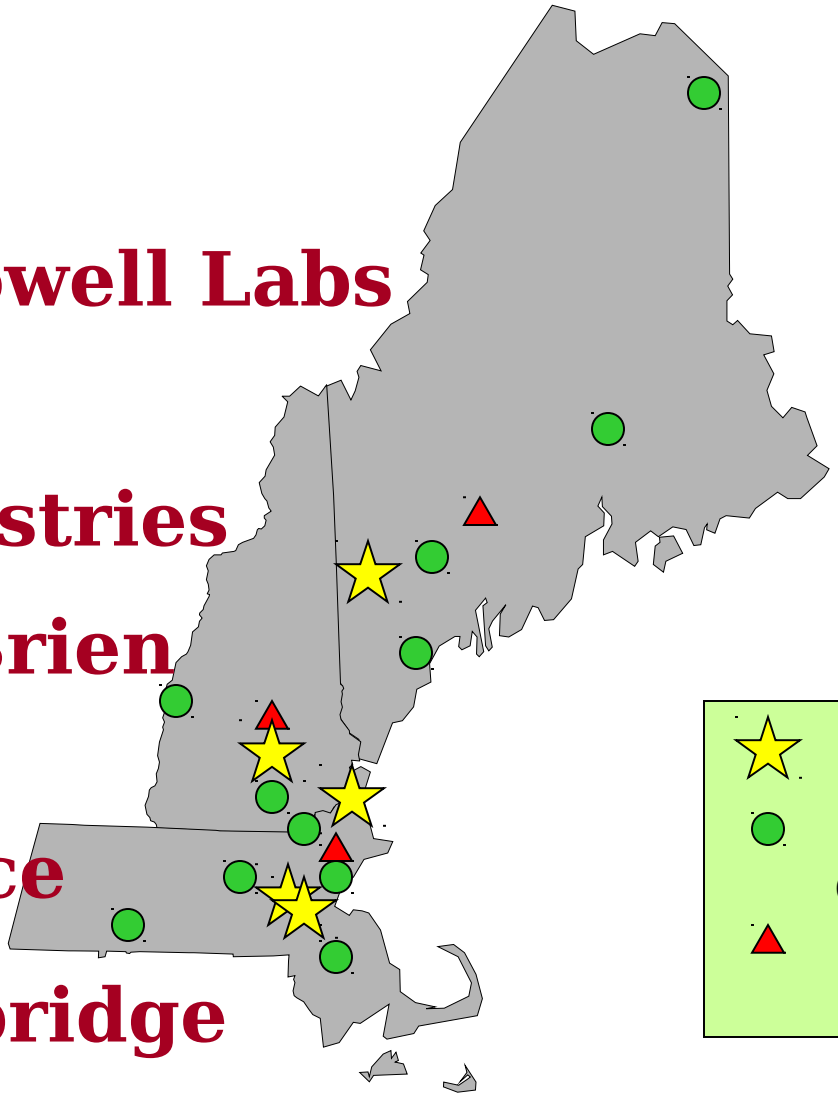
D. G. O'BRIEN, INC.

Rolls-Royce

Rolls-Royce

STONEBRIDGE
PRECISION MACHINING AND CERTIFIED WELDING

Stonebridge

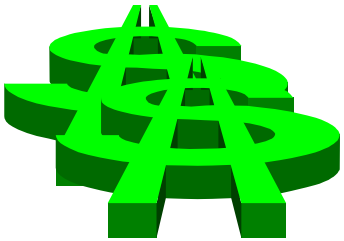


- Pilot Supplier Participants
- MEP Field Offices
- MEP State Headquarters

Methodology

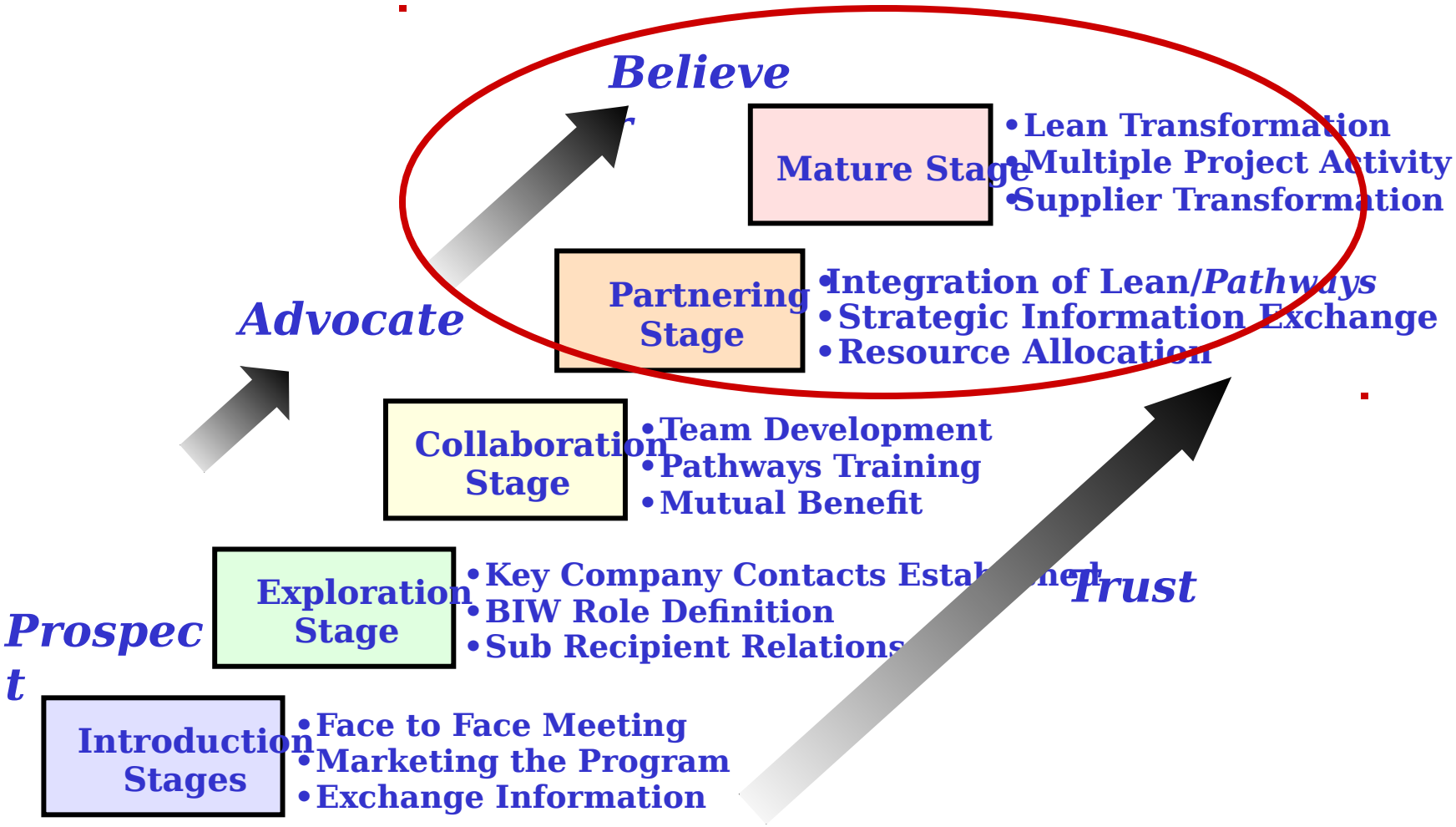
- **Phase One**
  - Establish Sub-recipient Relationship With Suppliers
  - Contract With BIW
  - Conduct Six *Pathways* Training Sessions to Create Roadmap for Project Definition and Approval
  - Integration of Lean Transformation Methodology
  - Development of Work Scope by Suppliers
  - Performance Metrics Selected & Tied to Each Supplier's Strategy
- **Phase Two**
  - One Improvement Project Selected
    - Project Implemented
  - Impact Measured by Performance Metrics
  - Supported by MEP Project Managers
  - Demonstration to ONR MANTECH: Spring, 2002

Leveraged investment



- **Navy MANTECH and DUS&T Financial Participation During *Pathways* and Early Implementation**
- **Other Matching Funds over 24 Month Program**

Continuum of TIA Development



Summary

- **The Shipbuilding Supplier Pilot Addresses Shipbuilding Manufacturing Issues including:**
  - **Quality Improvement**
  - **Cost Reduction and Avoidance**
  - **On Time Delivery**
- **Outcomes:**
  - **Suppliers Receive a Structured Approach to Improve Operations and Competitiveness**
  - **BIW / Other Primes Improve Their Supplier Base**
  - ***Products Become More Affordable***

Maine Manufacturing MEP Extension Partnership — Affiliated with NIST / MEP

Bath Iron Works — A GENERAL DYNAMICS COMPANY

Department of the Navy — ONR — Science & Technology

NAVY MANTECH — manufacturing technology program

Dual Use S&T

World Class Business Tools PATHWAYS

ONR/BIW/Maine MEP Shipbuilding Supplier Pilot Lean-*Pathways* Journey Phase I Review/Phase II Plans

Dave Dunfee, General Manager

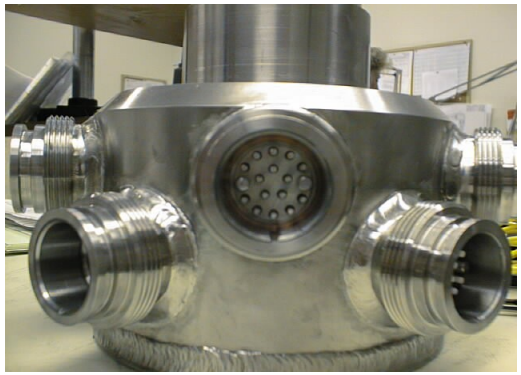
DG O'Brien, Inc.

Aug 13, 2001

Who is DG O'Brien?

- **In Business Since 1962**
- **Privately Owned**
- **Annual Revenue; $12+ M**
- **150+ Dedicated Employees**
- **45,000 Sq. Ft. Facility**
- **Self-contained Manufacturing Capability**
- **Two Locations:**
  - **USA: Seabrook, NH**
  - **UK: Bristol, England**

D. G. O'Brien, Inc.



Products:

-Connectors

-Hull Penetrator

-Cable Assemblies

-Junction Boxes

-Glass-to-metal seal

-Electric, Fiber Optics

Applications:

-Sonar Arrays

-Towed Arrays

-EMC, C3I

-Weapon Launch

-SDS

-OBE

Platforms:

US: 688, Trident, Sea Wolf, Virginia, DSV, DSRV, NR-1, Dolphin, Alvin, ASDS

Int'l: Shinkai 6500, RN Vangaurd, RAN Collins

How We Began…

- **Why Did DGO Want to Participate in Lean-*Pathways*?**
  - **Realization of the Need to Change**
  - **Recognized Value of Outside Assistance**
  - **Previous Success in Kaizen Event**
  - ***Pathways* Offers a Holistic Analysis of Your Business**

DGO Primary Business Drivers

- **At the Start:**
  - **Primary Driver was to Better Serve Diverse Customer Segments and Market Niches**
  - **Secondary Driver was to Offer a Higher Level of Value-Added Products for Customer Solutions**

- **When We Revisited Mid-way Through the Analysis:**
  - **Primary Driver Remained Serving Diverse Customer Segments and Market Niches**
  - **Secondary Driver Is to Support the Primary with Improved / Shortened Lead-times (Improved Quality and Reduced Cost)**

DGO Key Competitive Criteria

- **Key Order Winning Criteria is based on Customer Support through the Life of the Product**
  - **Design Leadership**
  - **Technical Support**
  - **Quality**

Opportunities from Value Stream Mapping

Growth Issues

Change Management

Organizational Culture
Teams
Lean 101

Kitting

Plant Layout

DGO Design
Architect Design
Flow
Special Projects

Material

Dial & GRE
(set-up reduction
Chaulk-Fast
Grommets & Inserts
Machine Shop
Glass Sealing
Tests / Inspections
Supplier Networks

Cable Assembly

5S Workplace Organization
Cell Flow
Pull to Takt
Lean & MRP

New Products

Information

Sales - Takt
Engineering
Production
Control
ERP/MRP
Documents

5S: Sort, Set in Order, Shine, Standardize & Sustain

- 8 Corporate Teams
- 2-day Event
- 15% Space Utilization Reduction or 6,750 Sq Ft Back
- 2 Thirty-yard Dumpsters of Waste
- 7 Truck Loads & 1 Truck

Before Cellular Flow

After Cellular Flow

Priorities Selected for Phase II

- **DG O'Brien Is Implementing Lean Manufacturing to Decrease Lead-time by 50%**
  - **Develop and Implement Work Standards**
  - **Control Disruptions**
  - **Plan for Corporate Growth**

Anticipated Benefits

- **Military Benefits**
  - **Improved Supplier Relationship for Quality, Cost and Time of Products Supplied for Military Applications**
- **Commercial Applications**
  - **DGO will capture More Market Share Where Quality, Cost and Time are Order Winning Criteria**

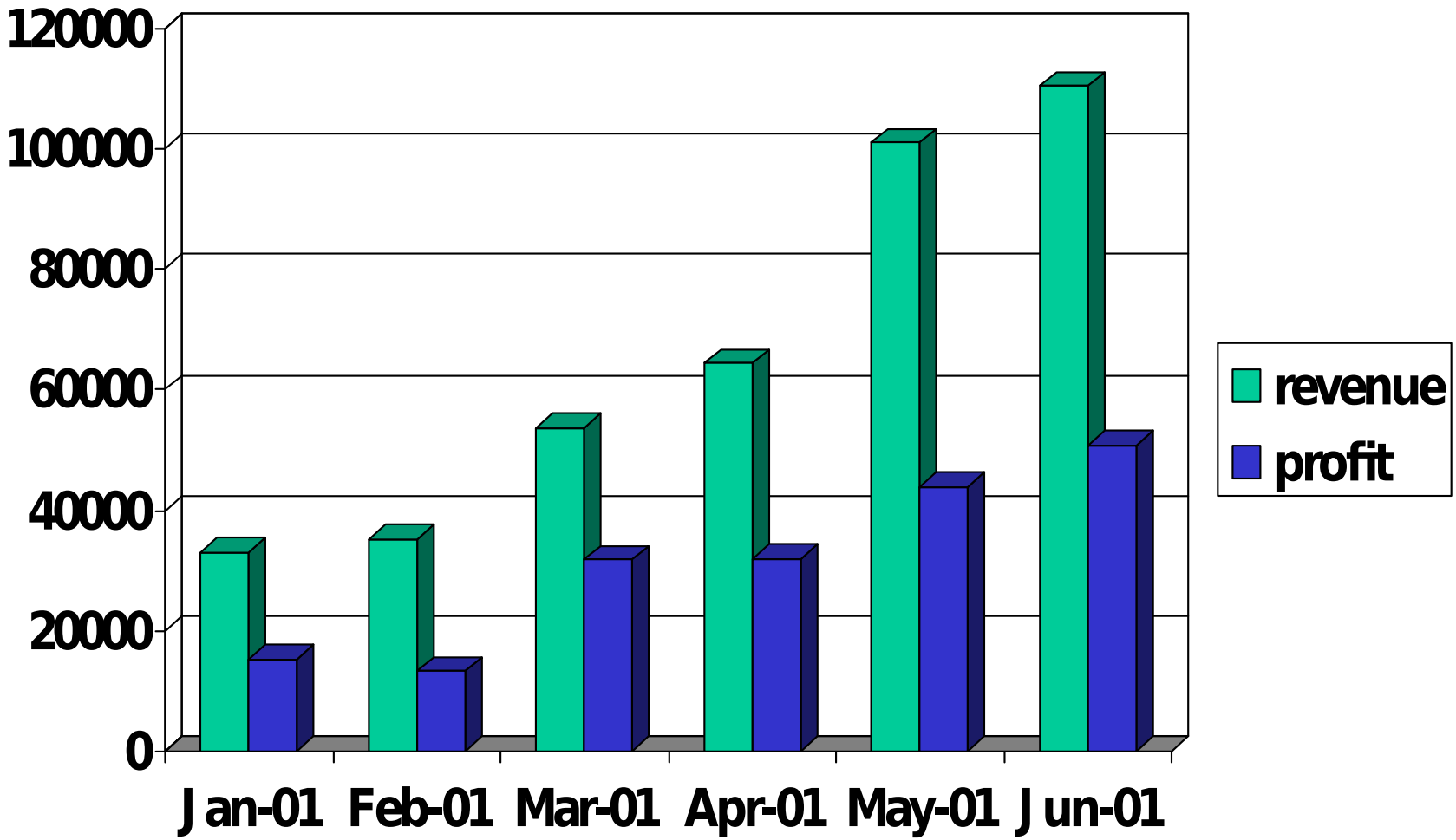
Key Performance Measures for Our Business

- **Key Measures Identified for DGO that relate to Performance Drivers were:**
  - **Revenue/Employee**
  - **Lead-Time Reduction**
  - **Scrap/Quality Costs**
- **Use of Leading Vs. Lagging Indicators Was Identified & Discussed**
- **The Measuring System Became More Precise With the Goal to Obtain Leading Indicators**

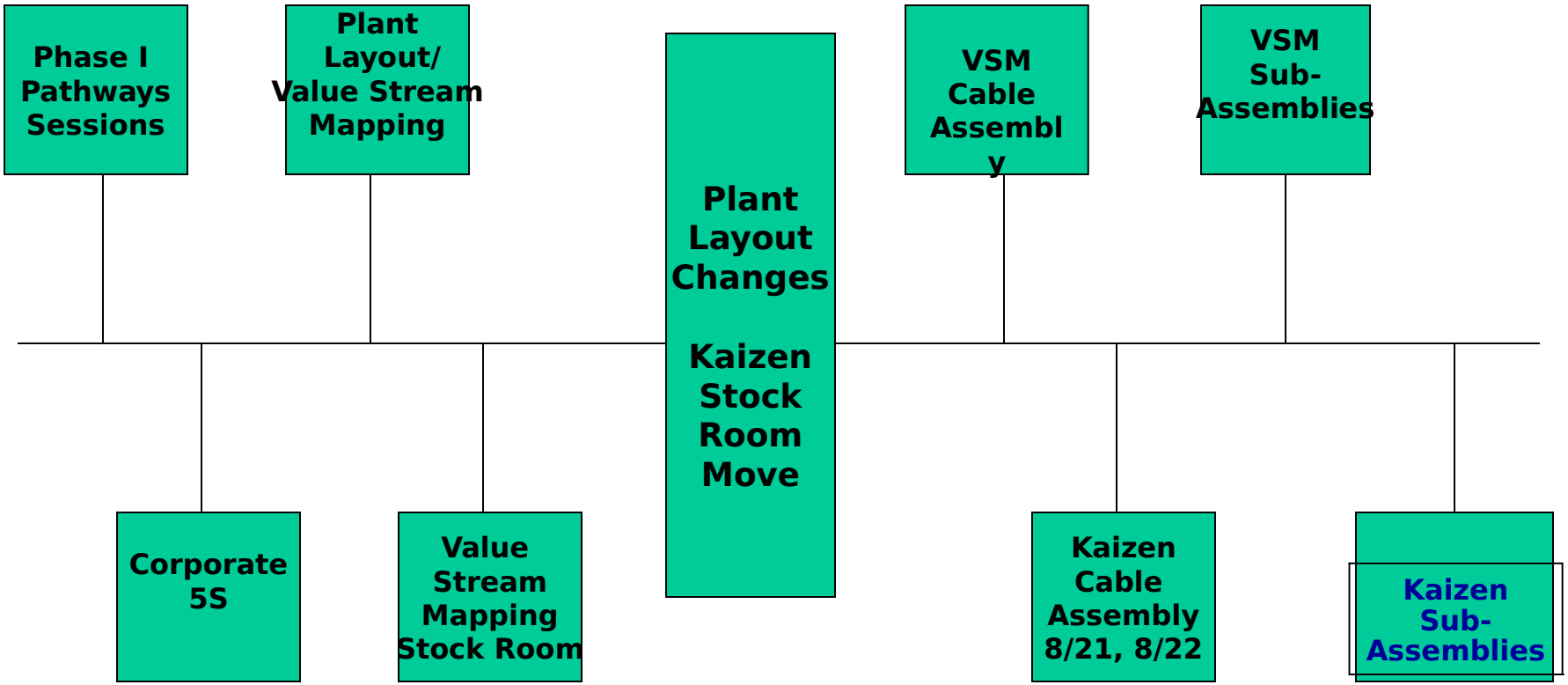
DGO Improvement Targets

- **Delivery to Schedule Targeted for 95% by March 2002, From 70% in March 2001**
- **Revenue per Employee to Sustain $100,000/cable Assembler by March 2002, From $31,788 in March 2001**

Revenue & Profit per Cable Assembler



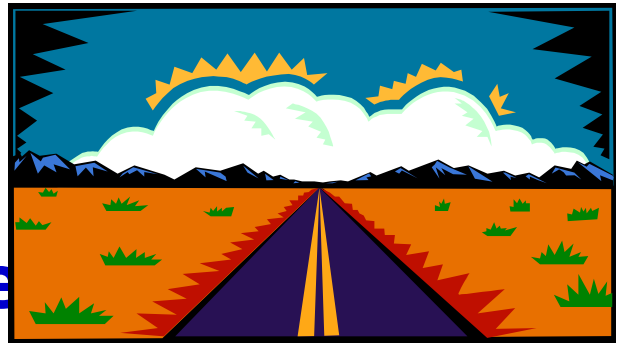
DGO Continuous Improvement Timeline



Reflecting Experiences to Date

- **Systematic Approach to reviewing Your Business**
- **Ability to Compare Performance against Industry Norms**
- **Narrowing Focus to Identify Key Areas for Improvement**
- **Formulate Detailed Action Plan**

Looking Forward…



- **Aggressive Schedule**
- **Value of NH MEP Assistance**
- **DGO Is Changing**
- **Excitement for Change Is Contagious**

ONR Lean-*Pathways* Future,

Joe Hering, PTI/ANDRULIS
Rick Davidson, PTI ANDRULIS
Ralph Day, Clemson University

Navy MANTECH Lean-*Pathways* Supplier Programs

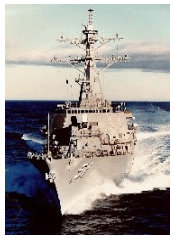
LEAN

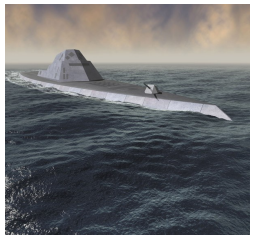
PATHWAYS

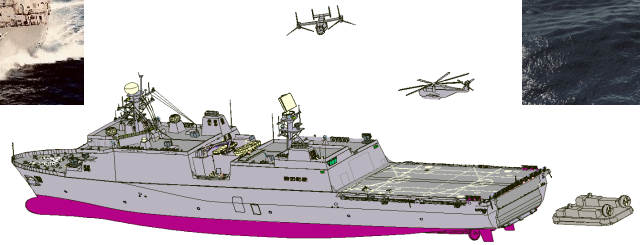
MARKET DRIVEN
STRATEGIES
MEASURES
OPERATIONS
CHANGE
PROFITABILITY

Maine Manufacturing MEP Extension Partnership
Affiliated with NIST / MEP

Bath Iron Works
A GENERAL DYNAMICS COMPANY







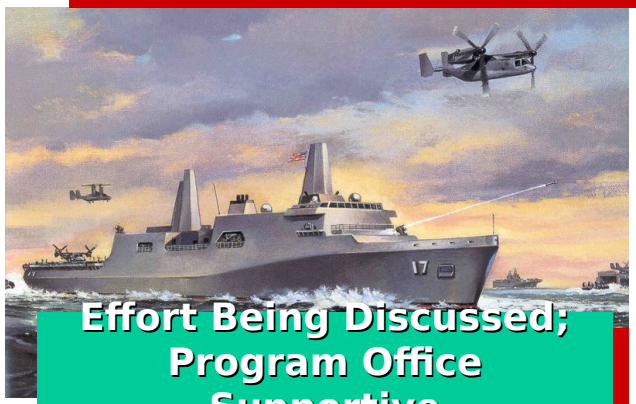
DEPARTMENT OF THE NAVY
ONR
Science & Technology

NAVY MANTECH
manufacturing technology program

SLAM-ER Supplier Lean Enterprise-*Pathways* Transformation Program

Navy MANTECH & SLAM-ER Program Office with 5 Boeing Suppliers

Lean-*Pathways* Supplier Excellence Program



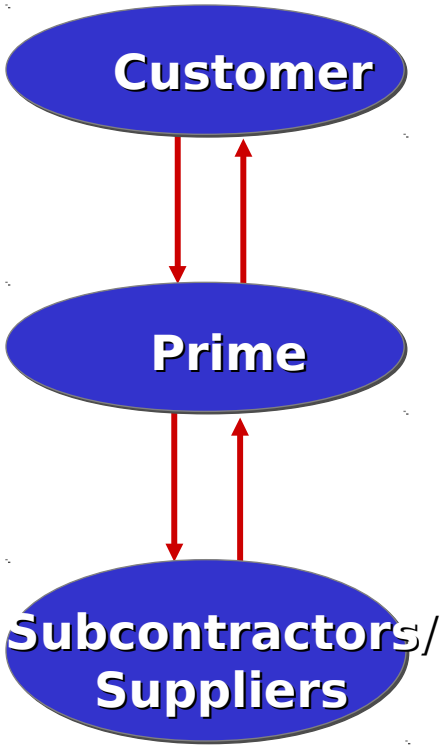
Effort Being Discussed; Program Office Supportive

Navy MANTECH & LPD-17 Program Office with ~ 5 Suppliers of Avondale and Ingalls

New Approaches Needed to Effect Results

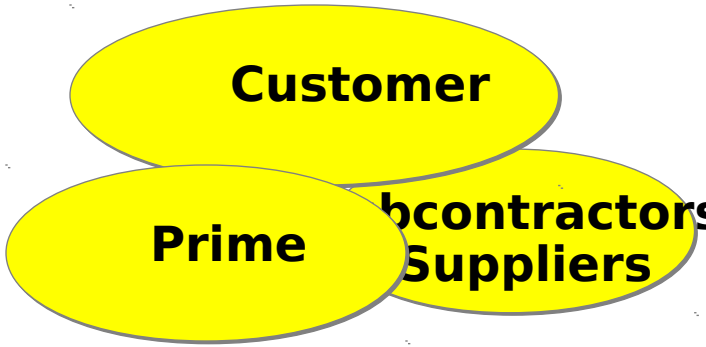
"Old" Approach

Rigid Vertical Interfaces and Control



"Emerging" (Lean-Pathw Type) Approach

Virtual Team Without Boundaries Enabling Continuous Innovation



Teaming To Win!

SLAM ER Lean- *Pathways* Approach
Top Dozen $$ and LLT Suppliers

SUPPLIER	EQUIPMENT	$ (%)	LEAD TIME (WEEKS)	TARGET LEAD TIME	
ABC	NAME	XX%	YY	<YY	*Own Initiatives*
DEF	NAME	XX%	YY	<YY	*Pathways Candidate*
GHI	NAME	XX%	YY	<YY	*Own Initiatives*
KLM	NAME	X%	YY	<YY	*Own Initiatives*
NNN	NAME	X%	YY	<YY	*Own Initiatives*
OOO	NAME	X%	YY	<YY	*Own Initiatives*
PPP	NAME	X%	YY	<YY	*Pathways Candidate*
QQQ	NAME	X%	YY	<YY	*Own Initiatives*
RRR	NAME	X%	YY	<YY	*Pathways Candidate*
SSS	NAME	X%	YY	<YY	*Pathways Candidate*
TTT	NAME	X%	YY	<YY	*Pathways Candidate*
VVV	NAME	X%	YY	<YY	*Own Initiatives*

Five Suppliers of SLAM-ER Program Strategic Importance Are Being Addressed by Lean-*Pathways*

What's in it for the Supplier?

- **Increased Labor Productivity**
  - Increasing the Output for the Same Number of People
- **Reduced Throughput Time and Inventories**
  - Flow and Velocity means less WIP
  - Frees up Cash for Other Purposes
- **Defects Reduced**
  - Usually a Result of the Improvements made to reduce Variability and Cycle Time
  - Less Waste, Scrap and Rework Cost and Schedule Interruptions
- **Results roll to the Bottom Line:**
  - Increased Operating Efficiencies improve competitiveness in chosen markets
  - Found Capacity available for increased sales

"There's more than enough evidence to support the fact that Lean works… .the payoff – for everyone involved – is proving to be well worth it. " -
Mike Sears, Chief Financial Officer, The Boeing Company

"We will leverage the savings from the integration of Lean and *Pathways*. *Pathways is a critical element of our* growth plan.
Jim O'Neill, General Manager, Navy Missile Systems

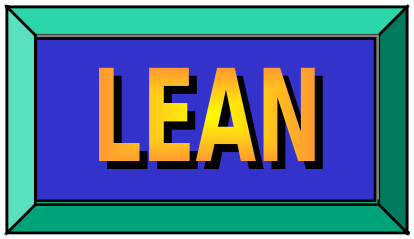
Supplier Selection-Some Characteristics

- **Small-Medium Supplier on Major Navy Program**
- **Certified Preferred Supplier to One or More Navy OEMs**
- **Supplier Willingness to Learn**
  - **Commit Resources for Improvements**
- **Diverse Products**
  - **Not Head to Head Competitors**
- **Products Have One or More of the Following Characteristics to Navy Programs:**
  - **Long Lead Time**
  - **High $$ Cost or Volume**
  - **Program Strategic Importance (Top 25-50)**

Recent Funding Approaches

- **Navy ManTech along with a Navy Supplier or other Navy Program Office Jointly Fund the Cost of:**
  - **Lean-*Pathways* Facilitation Labor & Expenses**
  - **Limited OEM Program Management Support**
- **Suppliers and OEMs Fund Cost of their Participating Teams**
  - **Suppliers are Reimbursed for All Travel Expenses**

Conclusion



- **Results to Date Are Compelling:**
  - **Reducing Suppliers' Inventory**
  - **Eliminating Non-Value Added Activities**
  - **Improving Cycle Time**
  - **Making Business / Management changes to Sustain the Process**
- **Win-Win-Win Strategy& Results**
- **ONR / Navy MANTECH Looking to Expand Participation**